

50X1-HUM

DATE:

50X1-HUM

DIST. 2: October 1947
January 1948

PAGES 7

SUPPLEMENT™

ATTACHMENT 1 50X1-HUM

ORIGIN

X	X	X				X			
STATE	WAR	NAVY	JUSTICE	R A F	C S D	A A F			50X1-HUM

- 50X1-HUM

<u>Description of Steel</u>	<u>"Dinorm"</u> <u>(Standard)</u>	<u>Measurements of Experimental Steels in mm</u>
C 22 or C 65	1013	40, 45, 80, 100, 120, 150
C 22	667	80, 100, 120, 150
C 35 or C 65	1013	185
Steel for lathe work ("Automatenstahl") St/A2	667	6, 10, 12, 13, 50
Steel for lathe work ("Automatenstahl") St/A2	668	14, 20, 24, 25, 30, 35
Plate steel for machining ("Automatenflachstahl") St/A2	1774	35x8, 40x8, 40x7, 50x12, 50x15, 50x45, 80x8, 80x50

CONFIDENTIAL

50X1-HUM

~~SECRET~~

~~SECRET~~~~CONFIDENTIAL~~~~SECRET~~ CONTROL
(U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

50X1-HUM

<u>Description of Steel</u>	<u>"Dinorm"</u> (? Standard)	<u>Measurements of Experimental Steels in mm.</u>	50X1-HUM
Hexagonal steel for lathe work ("Sechskant- Automatenstahl SW)	175	12,22	
" " "	176	22,24	
Round alloy steel VCN 35 h or 50CrV4	1013 1662	60,90,100,120,140 150,160,170 ø	
" " " VCN 45 or 58CrV4	1662	60 ø	
Round alloy steel VCMo 135	1662	60,150,165 ø	
Round alloy steel "Poldihütte" CNH	-	20,22,24,40,70,85 ø	
Round alloy steel VEN 35 w (obviously VCN 35 w)	1622	70,80,160 ø	
Round alloy steel 58 CrV4 or 50 CrV4	1013 667	60,100,120,150 ø	
Round alloy steel 50 CrV4	1667	80,160 ø	
Round steel "Böhler"	-	60 ø	
Round alloy steel "Krupp" VSM	-	60 ø	
Round alloy steel St37 MnSi	-	90 ø	
Ball bearing steel, best quality (Poldi) EK	-	25,35,60 ø	
Chromium-Silicon spring steel CSI "Harkort-Bicken"	-	50 ø	
Chromium-vanadium spring steel	-	-	

5. An expert's opinion on this list of steels has been given as follows:

- a. "A critical examination of these steels is a clear proof that they are all, and each in particular, suitable for either heavy vehicle construction or airplanes. 1 - 8 are unalloyed steels and are needed for all possible parts used in the construction of machinery.

~~SECRET~~ CONTROL
(U.S. OFFICIALS ONLY)~~CONFIDENTIAL~~~~SECRET~~

~~SECRET~~
SECRET CONTROL
(U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

-3-

Unfortunately there are mistakes in the list. Obviously Nos. 1 - 3 should read StC 22.68, StC 35.68 and StC45.68. Both the last two are frequently used as steels for screws to be used under conditions of great strain and at temperatures up to 400°C (450°C at the tip).

- b. The alloyed steels are much more confined in their use. For example, No. 10 VCN 45 is a chromium-nickel steel suitable for the greatest strains in heavy motor vehicle construction and in the aircraft industry. 58 CrV4 steel is a steel designed to replace VCN 45 steel. This chromium-vanadium steel was developed during the war, when nickel was no longer available. Its reliability has not been greatly tested, whereas VCN 45's reliability is without doubt.
- c. More or less the same applies to VCN 35 h and w steels and their "equivalent" 50 CrV4.
- d. No. 17 "Krupp" steel is a corrosion and acid-resisting steel, suitable for vehicle construction, particularly where an aggressive acid reaction is to be expected.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50, U.S.C., 31 and 32 as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

~~SECRET~~ CONTROL
(U.S. OFFICIALS ONLY)

CONFIDENTIAL

~~SECRET~~

~~SECRET~~ ~~CONFIDENTIAL~~
~~SECRET~~ CONTROL
 (U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

50X1-HUM

~~ATTACHMENT I~~

Detailed Evaluation of Schaffer und Budenberg Steels

1. Chromium-nickel Steel VCN 35 h (DIN 1662)

This steel is very tough and "elastic" (besitzt grosse Formänderungsmöglichkeit) and is suitable for lasting strains caused by bending, shock, vibration, torsion such as is demanded by crankshafts, driving shafts, axles, and locomotive pivots. Its chemical composition is as follows:

Carbon		0.27 to 0.35%
Silicon		0.35% at the most
Manganese		0.4 to 0.8%
Phosphorus - at the most		0.035%) together max. 0.6%
Sulphur " " "		0.035%)
Nickel		3.5% ± 0.25%
Chromium		0.75% ± 0.2%

Heat treatment

Forging, pressing, rolling	1100° to 950°C.
Heating (Glühen)	630° to 550°C.
Hardening	800° to 320°C. Quench in oil

Characteristics of strength

Tensile strength - room temperature - 90 to 105 kg/mm²
 Stretching limit - room temperature - 75% of tensile strength
 Elongation l = 5 d : 16 to 10%
 l = 10 d : 12 to 8%

Contraction 55 to 45%

Brinell hardness 235 kg/mm²

2. Chromium-nickel Steel VCN 45 (DIN 1662)

This steel has great strength and toughness, is particularly suitable for parts taking great strain in the construction of machinery, vehicles, and aircraft, for axles, steering columns, driving axles, piston rods, connecting rods, crankshafts, and cog wheels. This steel has also proved itself in cold and warm dies, molds, stamps, and recipients.

Chemical composition

Carbon		0.30 to 0.40%
Silicon		max. 0.35%
Manganese		0.4% to 0.8%
Phosphorus		max. 0.035% both together
Sulphur		max. 0.035% max. 0.06%
Nickel		4.5 ± 0.25%
Chromium		1.3 ± 0.2%

Heat treatment

Forging, pressing, rolling range 1100° - 1000°.
 Heating (Glühen) 560° - 580°.
 Hardening - either from 800-830°, quench in oil
 or from 820-850°, cool off in air.

Characteristics of strength: Brinell hardness 265 kg/mm²

~~SECRET~~ ~~CONFIDENTIAL~~
~~SECRET~~ CONTROL
 (U.S. OFFICIALS ONLY)

~~SECRET~~

~~SECRET~~~~CONFIDENTIAL~~~~SECRET CONTROL~~
(U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

-5-

50X1-HUM

ATTACHMENT I (Cont'd)Tensile strength (room temperature)

Glowing (gegüht): max. 90 kg/mm²
 Strengthened (vergütet): in oil 95 to 105 kg/mm²
 Tough, air-strengthened: 100 to 110 kg/mm²
 Hardened, air-strengthened: 110 to 160 kg/mm²

Limit of stretch (room temperature) = 80% of tensile strength

Elongation: l = 5 d / 15 to 9%
 l = 10d / 10 to 6%

Contraction: 60 to 45%

3. Chromium-vanadium Steel 50 CrV4 (Substitute for VCN 35)

Generally similar to VCN 35.

Chemical composition

Carbon		0.47 to 0.55
Manganese		0.70 to 1%
Chromium		0.90 to 1.2%
Vanadium		0.10 to 0.18%

Heat treatment

Forging, pressing, rolling 1100° to 850°
 Heating 680 to 720°C
 Strengthening: from 810° to 830°C water cool and
 anneal from 530° to 570° or 830° to
 850°C oil cool and anneal at 530°C.

Characteristic strength

Tensile strength (room temperature) 80 to 100 kg/mm²
 Limit of strength 65 kg/mm²
 Elongation l = 5 d : 11%

4. Chromium-vanadium Steel 58 CrV4 (Substitute for VCN45)

Usage as for VCN 45.

Chemical composition

Carbon		0.55 to 0.62
Manganese		0.70 to 1%
Chromium		0.90 to 1.2%
Vanadium		0.10 to 0.18%

Heat treatment as for 50 CrV4.

~~SECRET CONTROL~~
(U.S. OFFICIALS ONLY)~~CONFIDENTIAL~~~~SECRET~~

~~SECRET~~
~~SECRET CONTROL~~
 (U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

50X1-HUM

ATTACHMENT E (Cont'd)

Characteristics of strength

Tensile strength (room temperature) : 110 to 130 kg/mm²
 Stretch limit (room temperature) : 90 kg/mm²
 (Both for 4 to 100 mm. thickness)
 Tensile strength (room temperature): 90 to 110 kg/mm²
 Strength limit (room temperature) : 70 kg/mm²
 (Both for 100 to 175 mm thickness).

5. Chromium-molybdenum Steel VCh12 135.

Characteristics are similar to the above-mentioned steels.
 Mainly used for front axles, connecting rods, crankshafts, cog wheels, etc. undergoing high strain.

Chemical composition

Carbon		0.30 to 0.37
Silicon		max. 0.35%
Manganese		0.5 to 0.8
Phosphorus		0.035% } together
Sulphur		0.035% } max. 0.06%
Chromium		0.9 to 1.4
* Molybdenum		0.15 to 0.25

Heat treatment

Heat temperature (Glühen) up to 710°C
 Strengthening: (from 830°C to 875°C quench in oil or water
 and anneal from 500°C - 650°C according to
 strength desired.

Characteristics of strength - Brinnell hardness 179 - 217 kg/mm²

Tensile strength (room temperature)
 80 to 100 kg/mm² - lower figure for
 water quenching - higher figure for oil
 Limit of stretch (room temperature) - 70% of tensile strength.
 Elongation: l = 5 d : 16 to 10%
 l = 10 d : 10 to 6%

6. "Prump" - Martens Allow Steel 74M

Suitable for mechanical parts which come into contact with fresh, condensed water - not sea water - and with steam and such like atmospheric conditions. Good resistance against acids-e.g. cold or lukewarm nitric acid. Not suitable for welding, as certain hardeners appear in the process which can lead to cracks when cooling off.

Chemical composition

Carbon		0.2% approx.
Chromium		14%
Nickel		0.5% approx.

~~SECRET~~
~~SECRET CONTROL~~
 (U.S. OFFICIALS ONLY)

CONFIDENTIAL

~~SECRET~~

~~SECRET~~

CONFIDENTIAL

SECRET CONTROL
(U.S. OFFICIALS ONLY)

CENTRAL INTELLIGENCE GROUP

-7-

50X1-HUM

ATTACHMENT I (Cont'd)Heat treatment

Heating 720 - 780°C to be cooled off
in the furnace.
Strengthening - quench from a temperature of 950° - 1000°C
in oil or air; anneal at 600 - 750°C
Forging, jumping, rolling 1150° - 900° ensuing cooling off in
the furnace - followed by heating or strengthening as
described above.

Characteristic strength

Tensile strength (room temperature) 65 to 80 kg/mm²
Stretch limit 45 kg/mm²
Elongation l : 5 d 19%
Brinell hardness 190 to 220 kg/mm²

Creep limit 400°C 20 kg/mm²
 450°C 16 kg/mm²
 500°C 6 kg/mm²
 550°C 3.5 kg/mm²

7. Chromium-silicon Spring Steel. "Harkort - Eicken" (No. 20)

Suitable for heavy vehicles.

Chemical composition

Carbon 0.35 to 0.45%
Silicon 1.0 to 1.5%
Manganese 0.5 to 0.6%
Chromium 1.0 to 1.5%

Heat treatment

Forging, pressing, jumping, rolling: not over 1000°C.
Cooling from 800° to 820°C into water or oil and
anneal at 500 - 520°C.
Tensile strength 120 to 140 kg/mm²

Chromium-Vanadium spring steel (No. 21)

Same purpose as at 20 above.

Chemical composition

Carbon 0.45 to 0.55
Silicon 0.10 to 0.20
Manganese 0.70 to 0.90
Chromium 1 to 1.25
Vanadium 0.15 to 0.25

Heat treatment

Cool in oil from 810° to 820°C and anneal at 500 to 520°C.
Tensile strength 130 to 150 kg/mm²

SECRET CONTROL
(U.S. OFFICIALS ONLY)

CONFIDENTIAL

~~SECRET~~